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THE ROLE OF INCOME AND THE SUBSTITUTION PATTERN
BETWEEN DOMESTIC AND INTERNATIONAL TOURISM

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Abstract

This paper analyses the role of income in the decision of participating in the tourism demand within one year. The tourists who are participating, can travel to domestic destinations only, abroad destinations only, or to both of them. Such substitution pattern is modelled using a bivariate probit model. The analysis is carried out to the regional level using a survey conducted in 15 European countries. In addition to the traditional socioeconomic variables, the analysis adds new variables to the outbound tourism demand modelling, such as the attributes of the place of residence. The results show that tourism demand is income elastic. However, there are marked differences in the income elasticities of the probabilities of travelling domestically or abroad. Above certain income threshold, the substitution pattern between destinations takes part. The probability of travelling domestically only remains constant, whereas the probability of travelling abroad keeps growing. Additionally, the paper proves that income elasticities vary significantly and non-linearly with income.

I. Introduction

In recent decades, the relative amount of consumption on basic goods as food or clothing has been decreasing over time in favour of other consumption alternatives, such as tourism. Many regions have seen in the increase of international tourism demand as an alternative to the traditional economic activities. Provided tourists consider the region as an attractive place to visit, tourism offers a significant opportunity for economic growth and development (Balaguer and Cantavella-Jordá, 2002). Tourists need accommodation, food, transportation and entertainment services. Most of these services are labour intensive and therefore their development provides growth in terms of income and employment. Moreover, tourism sector provides a significant multiplier effect on other sectors and it contributes to the current account of the balance of payments. Along this line, increasing inbound international tourism demand has been a worldwide common target. However, more attention is being paid to the role of domestic tourism. Encouraging domestic tourism has two positive effects for a country. On the one hand, it helps retaining the benefits within the country and on the other hand, it also may help to keep a balance between the growth of the regions within a country, transferring consumption from the richer to the poorer regions. Nevertheless, not all the countries and regions are equally able to retain or attract domestic tourists from other regions of the country.

Analysis of tourism markets is a prerequisite for formulating an adequate policy for attracting tourists. For this purpose, the authorities must identify the key variables that attract tourists to choose a destination and must also attempt to adapt the attributes of the destination to meet the tourists' requirements. However, the tourism policy cannot be based solely on the preferences of current tourists,

but must also take account of those people who do not travel. Understanding the reasons why people do not travel is relevant for current tourist destinations but even more for new or potential tourist destinations because they can try to attract a latent demand.

During a period of time, say a year, any individual, family or household usually faces the decision of whether or not to take holidays. This decision is what we refer to as the participation decision in tourists' demand for holidays (Mergoupis and Steuer, 2003). The main purpose of this paper is to study the determinants of the decision of travelling in the country of residence and or, travelling abroad within one year period. Participation decisions have been analysed as part of multiple-stage models for estimating different purposes, such as expenditure (Hagemann, 1981; Van Soest and Kooreman, 1987; Melenberg and Van Soest, 1996), destination choice (Eymann and Ronning, 1997; Nicolau and Mas, 2005), length of stay (Fleischer and Seiler, 2002) and number of trips (Hellström, 2006). More specific research on the participation decision has been considered by Mergoupis and Steuer (2003) and Alegre and Pou (2004). All the models above show the relevance of the socioeconomic characteristics of the individuals in order to estimate the willingness to travel and amongst them, special attention is paid to the role of household income.

However, explicit distinction between participation at the domestic and international level has only been explored by Van Soest and Kooreman (1987) and Nicolau and Mas (2005). Increases of income after a certain threshold may increase the probability of taking an international holiday, but at the same time it may decrease the probability of travelling domestically. Such a substitution pattern between both alternatives requires of a simultaneous estimation of both

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decisions as carried out by Van Soest and Kooreman¹. Hence, rather than estimating independent binary decisions as in Nicolau and Mas, it is preferable to estimate a bivariate binary model that encompasses both decisions and allows testing for the substitutability between the two alternatives. For this purpose, this paper proposes the estimation of a bivariate probit model.

The willingness to travel, the willingness to travel domestically and the willingness to travel abroad may be affected not only by the income level of the household but also by the characteristics of the region of residence. In this sense, the substitutability between travelling domestically versus abroad may also be affected by regional attributes of the place of residence of the household such as the weather, the location of the region on the coast, the proximity of the region to an international frontier, the size of the community where the household lives, or the presence of national and or international airports near the household, among others. None of the previous studies on participation of tourism demand have considered regional attributes of the place of residence of the household. Leaving aside such regional characteristics may cause biased results in the parameter estimation of the income effect and of subsequent elasticity and probability analyses. In order to incorporate these additional determinants, this paper extends the participation analysis from the national level to the regional level. The regional level² has only been considered by Mergoupis and Steuer (2003), but employing dummies per region as the only regional information. Therefore, this paper provides a novel approach that estimates simultaneously the decision of participation between travelling domestically and or abroad, including the

¹ Van Soest and Kooreman (1987) employ simultaneous estimation between domestic and abroad percentage of tourism expenditure in relation to the income level.

² Eymann and Ronning (1997) also consider the regional level but their purpose of study is the destination choice within a country.

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socioeconomic characteristics of the household and the regional attributes of the place of residence from a pool of 16,183 households from 226 European regions (at NUTS 2 level from EU-15).

II. Economic model

The economic approach to the tourism demand can be carried out from a macro-level or a micro-level point of view. A macroeconomic framework deals with the relationship between tourism demand and main macroeconomic variables such as GDP, exchange rates or inflation amongst many others (Syriopoulos and Sinclair, 1993; Song et al., 2000). Despite its convenience in terms of accessing data, one of the main constraints of this approach is that it relies on the assumption that each national tourist is identical at the micro-level and that they travel to all the destinations at the same time (Papatheodorou, 2001). This paper proposes a micro-founded utility model which can incorporate socio-economic variables of the tourists (Hagemann, 1981). Moreover it points out the attractiveness of the place of residence of the tourist as a key variable of the individual’s decision in order to consider outbound tourism as a corner solution or not.

Under the microeconomic framework, rather than analysing an ‘average consumer’ per region of origin, a sample of individuals is employed. These models assume individuals possess a utility function, which determines their decisions. In this sense, an individual, given a budget constraint, will choose the destination that offers highest utility level. For simplicity of the exposition, two different stages in the economic modelling are considered: first, the participation decision, and then the destination choice between travelling domestically and or abroad.

Stage 1: Participation decision

Participation decision in tourism demand can be studied under the neoclassical theory of consumer choice. Under this approach, each individual, i , maximizes his or her utility $U_i(d_i, q'_i)$ from the number of days spent in tourism, denoted by d_i , and from n other goods consumed, denoted by $q'_i = (q_{i1}, q_{i2}, \dots, q_{in})$. For simplicity, at this stage, it is assumed that those individuals who decide to travel do it only once. Therefore, the utility is not affected by the number of journeys taken but by the total number of days spent on the destination. Individuals are constrained by the maximum amount of time they can spend on holidays, denoted by T_i . Not all the available time for holidays can be spent at the destination because they also need to spend some time in transit between their place of origin and the destination, t . Therefore, the time availability constraint is $d_i \leq T_i - t$. Individuals' decisions are also constrained by available income, denoted by Y_i . This can be spent on other goods q at prices p and on tourism. For simplicity, it is assumed p is a vector of 1s. Two prices are considered for tourism: transportation fare, denoted by f , and the daily price of tourism, p_d , which includes for instance, those expenses in accommodation or food.

The optimal solution provides the number of days spent in tourism, d_i^* , and the associated tourism expenditure, $Y_{it}^* = Y_i - q_i^*$. The solution will depend on the marginal rate of substitution between consuming tourism and other goods, $(\partial U_i / \partial d_i) / (\partial U_i / \partial q_i)$ and the price of tourism. Assuming preferences are strictly convex, at least three different solutions may arise. Two of these solutions are

boundary solutions. One corresponds to the case when $(\partial U_i / \partial d_i) / (\partial U_i / \partial q_i) < p_d$, where the individual decides not to participate, $d_i^* = 0$, and the other one corresponds to the case when the individual prefers to spend the maximum number of available days on holidays, $d_i^* = T_i - t$, where $(\partial U_i / \partial d_i) / (\partial U_i / \partial q_i) > p_d$. Alternatively, the individual can choose an interior solution when $(\partial U_i / \partial d_i) / (\partial U_i / \partial q_i) = p_d$, where the number of days $d_i^* \in [1, T_i - t]$. Different individuals possess different flexibility when choosing the length of their stay. Some individuals prefer to book in advance a fixed amount of days to stay, whereas others can depart and once they are at the destination they can choose when they want to return. Depending on each case, the value of the price associated with tourism varies and hence the budget constraint. It is considered that the individual needs to pay a fixed fare, f , for travelling which it is open to decide the day of return. In this case, the individual considers the fare paid as a sunk cost, such that the opportunity cost of an extra day of stay at the destination is p_d . Therefore, the budget constraint is $p' \cdot q_i \leq Y_i$ if the individual does not participate in tourism demand and $p' \cdot q_i + f + p_d \cdot d_i \leq Y_i$ if he or she participates. As shown in Figure 1, non-participation solution is obtained in point A, interior solution can be reached in any point on the line segment BD, such as point C and if the individual decides to spend all his or her available time in tourism then a boundary solution is attained in point D.

[Figure 1 about here]

Stage 2: Destination choice

Given the decision to participate in tourism demand, ($Y_{it}^* > 0$), and the optimal number of days the individuals wish to spend, d_i^* , the analysis can be extended to study the participation decision of travelling domestically, $d_{di} > 0$, abroad, $d_{ai} > 0$, or to both of them. For this purpose, it is more suitable to extend the analysis employing Lancaster's (1966) approach to study such decisions (Rugg, 1973). This approach considers that the individuals can obtain different utility levels from enjoying different destinations depending on the attributes that define each possible destination. Individuals yield utility from the tourism experience, which depends on the enjoyment of the attributes of the destination themselves and the number of days spent. A set of attributes z' can be enjoyed from each destination with a different intensity according to a consumption technology function, such that for each j th attribute, $z_j = g_j(d_d, d_a)$. This function varies for each attribute depending on the nature of the attribute. In this sense, as suggested by Morley (1992), there are three different sorts of attributes that can be obtained from the tourism experience. Some attributes, as those that define the physical conditions, are enjoyed at a fixed proportion, depending on the number of days spent at the destination. An example is the enjoyment of the weather. However, other attributes are enjoyed with a different intensity as the number of days spent in the destination increases. For instance, this may be the case of the experience of enjoying a new environment. Finally, some attributes can be enjoyed by tourists at once, independently on the time spent, as for instance, visiting a particular place, such as a monument or a museum.

For illustrative purposes, two attributes are considered. One attribute, z_1 , indicates the comfortability and security at the destination and the other attribute, z_2 , represents the novelty of the experience. Relaxing the assumption stated in the previous stage, two alternative destinations can be chosen. One destination is located in the same country of residence and the other one is located abroad.

In this case, the consumption technology can be represented for each attribute linearly. This consumption technology may be perceived differently across individuals, such as:

$$z_{1i} = \delta_{1ai}d_{ai} + \delta_{1di}d_{di}$$

$$z_{2i} = \delta_{2ai}d_{ai} + \delta_{2di}d_{di}$$

Since the enjoyment of a new environment, characteristic z_2 , can decrease with the number of days spent in the destination abroad, then a non-linear relationship may also be considered for z_2 , such that: $\delta_{2ai} = -\beta_{1i}d_{ai} + \beta_{2i}$ and hence $z_{2i} = -\beta_{1i}d_{ai}^2 + \beta_{2i}d_{ai} + \delta_{2di}d_{di}$. For each destination, the enjoyability obtained from each attribute on a daily basis can be represented with dotted lines as shown in Figure 2.

The frontier that reflects the maximum amount of attributes the i th individual can enjoy, is subject to the prices of each destination and the available income for tourism expenditure, as obtained in the previous stage, $Y_i^* = Y_i - p'q_i^*$. This approach allows for relaxing previous assumptions. Now, each destination has a different price for the fare, f_a for abroad, and f_d for domestic and different daily prices, p_{da} and p_{dd} , respectively.

Hence, conditioned to the available income for tourism expenditure and the prices of the destination, the number of maximum days the individual can spend at the

destination are defined by: $\bar{d}_{ai} = (Y_{ti}^* - f_a) / p_{da}$ and $\bar{d}_{di} = (Y_{ti}^* - f_d) / p_{dd}$. These maximum points are represented on the dotted lines in Figure 2 by OA and OC respectively.

[Figure 2 about here]

Using the two attributes help to show how the preferences of the individuals can drive them to choose between both destinations. Individuals maximize utility from the attributes they enjoy in the tourism experience subject to the consumption technology and the budget constraint:

$$\text{Max}_j U_i(z'_i) \quad \forall j$$

Subject to:

$$z_{ji} = g_{ji}(d_{di}, d_{ai})$$

$$(f_a + p_{da}d_{ai}) + (f_d + p_{dd}d_{di}) \leq Y_{ti}^*$$

Three different solutions can be obtained. Two of them represent corner solutions, such as point A, which it is attained when the individuals prefer to travel abroad only, and point C when they prefer to travel domestically only. The line segment that joins these two points represents attainable combinations of the attributes for the individuals. The set of points that lie on this line segment are possible interior solutions that happen when they decide to go to both destinations, as represented for instance, by point B in Figure 2. A decrease in the price of travelling abroad allows the individual to stay longer in that destination, shifting the frontier of possibilities of consumption from AC to AD as shown in Figure 2. Such a change

in price implies the individual reaches a corner solution (point D) of participating abroad only instead of previous combination of both destinations.

Any optimal solution depends on the ratio of marginal utilities of the attributes and prices (Deaton and Muellbauer, 1980: 250-2). Hence, what matters are not only the possible changes in prices but also the understanding of the preferences of the individuals, i.e. utility functions. The purpose of next section is to model the preferences of the individuals in participation, taking into account the socioeconomic characteristics and the attributes of the place of residence of the individual.

III. Econometric model

The participation decision is considered as a simultaneous choice between not travelling, travelling domestically only, travelling abroad only and travelling both domestically and abroad, all these within last 12 months. The decision of travelling abroad may not be independent of the decision of travelling in the home country. Indeed, since the available leisure time and income allocated for holidays are limited, both sorts of destinations may be substitutes. Hence, independent probit regressions could be misleading. Therefore, seemingly unrelated bivariate probit model is employed. The advantage is that it allows for correlation of the error term between both decisions.

For each individual, denoting by T_d^* the latent variable of the willingness to travel domestically and T_a^* the latent variable of the willingness to travel abroad, the bivariate probit model can be specified as:

$$T_d^* = \alpha_d + \sum_j \beta_{dj} SE_j + \sum_a \beta_{da} A_a + \varepsilon_d = x_d' \beta_d + \varepsilon_d$$

$$T_a^* = \alpha_a + \sum_j \beta_{aj} SE_j + \sum_a \beta_{aa} A_a + \varepsilon_a = x'_a \beta_a + \varepsilon_a$$

where both errors ε_d and ε_a are joint normal with means zero, variances one, and correlation ρ . If the coefficient of correlation $\rho = 0$ then the model collapses to two separate probit models. α_d and α_a are constant terms, SE_j denotes j^{th} socioeconomic variable of the household or individual, A_a denotes a^{th} attribute of the place of residence of the individual and $\beta_{dj}, \beta_{da}, \beta_{aj}$ and β_{aa} denote their associated parameters. The latent variable is defined as an index function such that:

$$T_d = \begin{cases} 0 & \text{if } T_d^* > 0, \\ 1 & \text{if } T_d^* \leq 0, \end{cases}$$

$$T_a = \begin{cases} 0 & \text{if } T_a^* > 0, \\ 1 & \text{if } T_a^* \leq 0, \end{cases}$$

From this model, a set of probabilities may be calculated in the following way:

$$p_{11} = \Pr[T_d = 1, T_a = 1] = \Pr[T_d^* > 0, T_a^* > 0] = \Pr[-\varepsilon_d < x'_d \beta_d, -\varepsilon_a < x'_a \beta_a] =$$

$$= \Pr[\varepsilon_d < x'_d \beta_d, \varepsilon_a < x'_a \beta_a] = \int_{-\infty}^{x'_d \beta_d} \int_{-\infty}^{x'_a \beta_a} \phi(z_d, z_a, \rho) dz_d dz_a = \Phi(x'_d \beta_d, x'_a \beta_a, \rho)$$

$$p_{10} = \Pr[T_d = 1, T_a = 0] = \Pr[T_d^* > 0, T_a^* < 0] = \Phi(x'_d \beta_d, -x'_a \beta_a, -\rho)$$

$$p_{01} = \Pr[T_d = 0, T_a = 1] = \Pr[T_d^* < 0, T_a^* > 0] = \Phi(-x'_d \beta_d, x'_a \beta_a, -\rho)$$

$$p_{00} = \Pr[T_d = 0, T_a = 0] = \Pr[T_d^* < 0, T_a^* < 0] = \Phi(-x'_d \beta_d, -x'_a \beta_a, \rho),$$

where ϕ and Φ are, respectively, the bivariate standard normal probability distribution function and bivariate standard normal cumulative distribution function for (z_d, z_a) with zero means, unit variances, and correlation ρ . Since these probabilities do not have a closed form for the integral, then this integral

needs to be evaluated with simulation. Finally, maximum likelihood estimation is applied to the model in order to estimate parameters of interest. The likelihood function employed is:

$$\begin{aligned} \ln L = & \sum_{T_a=0, T_d=0} \ln \Phi(-x'_d \beta_d, -x'_a \beta_a, \rho) + \sum_{T_a=1, T_d=0} \ln \Phi(x'_d \beta_d, -x'_a \beta_a, -\rho) \\ & + \sum_{T_a=0, T_d=1} \ln \Phi(-x'_d \beta_d, x'_a \beta_a, -\rho) + \sum_{T_a=1, T_d=1} \ln \Phi(x'_d \beta_d, x'_a \beta_a, \rho) \end{aligned}$$

IV. Dataset

Two different datasets are considered. On the one hand, a survey conducted at the household level which incorporates the socio-economic characteristics and on the other hand, a set of regional attributes that define the place of residence of the household.

The survey is based on a stratified weighted survey of 16,183 households carried out from European Union (EU-15) countries in 1997. Amongst various issues, the survey covers information concerning holidays taken and socioeconomic variables, such as income³, occupation, age, gender, education, number of children, number of adults, marital status and the size of the community of residence.

Two different kinds of attributes are considered, tourist infrastructure and geographical attributes. Within tourist infrastructure, the existence of airports and the prices of hotels are considered. Amongst the geographical attributes, weather, size of natural reserves, and coast are included.

³ It should be noted that income is gathered as an interval variable and a quarter of the sample did not state it. In order to consider the whole sample and avoid sample selection bias, income is predicted employing two step Heckman's (1979) procedure. This is followed by double censored grouped data (Stewart, 1983 and Bhat, 1994) income prediction in order to convert the grouped data into a continuous series.

National airports and International airports are two discrete variables that consider the number of commercial airports available to the individual within a radio of 60 kilometres at the national and international level respectively. Hotel prices are obtained from the World Travel and Tourism Council Hotel Price Index. From there, a sample of hotel prices of three and four stars hotels are averaged independently. Further averaging of these two prices gives a final daily hotel price index. Using this index as the daily cost of stay in a regional hotel, and dividing it by household income, gives a relative measure of hotel prices for each household. Weather is an index which combines temperature, total rainfall and the number of days of rainfall per month. Such index is explained in the Appendix and it may take any value between 0 and 12 depending on how comfortable is the weather in order to practice tourism during the year. For its construction, data is collected from World Meteorological Organization. Area of natural reserves is a continuous variable that measures the extension of natural sites in the region. This is composed by National Parks and Natural Reserves. More precisely these are regions defined as type II or type V category by IUCN (International Union for Conservation of Nature and Natural Resources). Data is collected from UNEP-WCMC (United Nations Environment Programme - World Conservation Monitoring Centre) protected areas database. Coast is considered as a dummy variable that takes unitary value if the region is on the coast.

V. Results

Estimation

The bivariate probit estimation has the advantage of running a joint estimation between the participation decision of travelling domestically and or abroad.

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Hence, correcting for correlation between the two decisions. Indeed, ρ can be tested, such that if it is different than 0, then independent probits is the right approach but if it is different than 0 then the bivariate probit is the right procedure. Using Wald test, it shows that the null hypothesis of $\rho = 0$ is rejected. Hence the bivariate probit is proved to be the appropriate approach for modelling. The estimated parameters of this model are shown in Table 1.

[Table 1 about here]

As expected, income is highly significant and positively related with demand. Income elasticities vary from one level of participation to another. Taking holidays at the national level is inelastic (0.377), whereas international tourism is relatively elastic (1.188), according to the mean values. Further analysis of the income elasticities and its non-linearity is explored below.

Although the main purpose of the paper is to estimate the role of income in the participation decision in tourism demand and destination choice between travelling domestically and or abroad, the role of the other variables is also worthwhile mentioning. As shown by Mergoupis and Steuer (2003), women are keener on participating in tourism. Older individuals participate more actively in international tourism demand. Education level is highly significant, indeed, those who have studied longer are more interested in travelling. The size of the household in terms of the number of children and adults is a significant constraint in the probabilities to travel. Those households that have children are more likely to travel at the national level than internationally. Overall, despite that marital status has proved to be insignificant, individuals who are divorced or separate are

less likely to travel, whereas married couples are more likely to take a holiday. Occupation is a highly relevant determinant. The occupation that provides by far the highest probability of holiday taking is studying. At the international level, general managers and self-employed professionals are more likely to travel, in contrast to unemployed, fishermen and manual workers. Owners of their own business are also very limited in their probabilities for travelling.

The socioeconomic characteristics may reveal the probabilities of taking holidays of different types of people. Nevertheless, households with similar characteristics but located in very different environments may have different willingness to travel. The members of a household located in a popular tourist destination may not have the same willingness to travel and pay for such a trip, than those living in less popular destinations. In this sense, the attributes of the place of residence may have a role as a determinant for participating in tourism demand.

Unlike most of the socioeconomic characteristics, the attributes of the place of residence are positive or negative determinants depending on the destination choice considered. Individuals living in large communities are more likely to have participated in tourism activities. They may have better transportation facilities and accessibility than those living in isolated and small communities. The probability of having travelled is lower in those regions with good weather and located on the coast. The opposite results have been found for national and international tourism. Living in a coastal area and having a good weather increases the possibilities for practising national tourism, possibly in the same region, and decreases the chances of travelling abroad. The existence of a national airport in the region will help in taking holidays nationally, whereas an international airport increases the probability that the individual will travel

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abroad. Expensive hotel prices in the region increase the chances of travelling abroad rather than nationally. Finally, if the region is characterised by large natural reserves, then it is likely that the individual will prefer not to travel much, especially internationally.

The role of income and the substitution pattern between travelling domestically and abroad

As explained above, the probabilities of choosing any alternative can be estimated. More specifically, it can be shown how each of these probabilities may change with variations on the exogenous variables. In this section, a set of figures show how destination choice varies with income.

[Figure 3 about here]

Figure 3 shows the relationship between income and any of the four alternatives considered in the modelling (not travelling, travelling domestically only, travelling abroad only and travelling domestically and abroad). This figure calculates the median of each of the probabilities for a given income bandwidth. The joint of these points is carried out using interpolation provided by non-parametric techniques. The figure shows a positive relationship between travelling and income. However, a different pattern is shown for domestic and international tourism. While the probabilities of travelling to an international destination increases with income, it is not the case of the domestic tourism. The probability of travelling to a domestic destination increases with income until wage is 1,000 euros per month. However, increases in income beyond 1,000 euros do not

increase the probability of travelling domestically. Indeed, for earnings of 4,000 euros and beyond, the probability starts decreasing. Overall, it seems that domestic tourism and international tourism are substitutes and that as long as income increases, international tourism is preferred to domestic tourism in choosing a destination.

Further analysis considers 3d contours of the relationship between income and the different probabilities of travelling home and abroad. This is shown in figures 4, 5, 6 and 7. These contour figures represent the bivariate density distribution between income and each of the probabilities of travelling. The darker the figure the higher the joint probability is. In this sense, a non-dark area represents a very unlikely combination of income and the probability of travelling and viceversa, the darkest area represents the bivariate mode of the distribution. An additional advantage of this representation is that it allows the analysis of the distribution of the probability of travelling conditioned to a given value of income.

[Figure 4 about here]

[Figure 5 about here]

[Figure 6 about here]

[Figure 7 about here]

Figure 4 shows a negative relationship between the probability of not participating in tourism demand and income. The mode is to have a probability of not travelling of around 60% and around 1,200 euros of income per month. Overall, it seems to be a linear relationship between income and the non-participation decision for all

levels of income. This is the traditional relationship considered in the literature. Using the same scale of figure 4, figure 5 shows a low joint probability of travelling domestically and abroad within a year. It shows that most of the individuals need to choose either travelling domestically or abroad. This may happen due to time constraints, income or weather conditions of the place of residence. Such low joint probability of travelling to both sorts of destinations provides additional interest to the analysis of the destination choice and its relationship with income. The modelling allows for further disentangling of the probabilities of travelling and its relationship with income. This is explored using figures 6 and 7, which show the joint density of income and the probabilities of travelling domestically only and abroad only respectively. Comparing figures 6 and 7, it seems clear that as income grows the probability of travelling abroad only also does, whereas the probability of travelling domestically only does not. Once the household reaches certain income threshold, it seems that further increases in income does not affect the probability of travelling domestically only, leaving this unaltered. From the figures, it can be seen that when income is 1,000, the probability of travelling domestically only is between 10% and 20% following a normal distribution around these values, though with a longer tail on the right hand side. However, the probability of travelling abroad only is positive skew, with very low probability when income is 1,000 euros per month. Furtherly, the similar analysis can be carried out for other levels of income, such as for 2,000 and 3,000 euros per month. For a given income of 2,000 or 3,000, the probability of travelling domestically only has a similar mode of around 18%, which it is slightly higher than for a given income of 1,000. The probability of travelling abroad only when income is 2,000 follows a normal distribution with mode of

around 30% and for an income of 3,000, a mode of around 40%. It should be noted that the tails of this probability are also much longer than those of the probability of travelling domestically only. This analysis reveals that domestic tourism is much less elastic than international tourism.

In order to get a closer picture of the income elasticities, these are calculated at different points of income, more precisely at percentiles 1, 5, 10, 25, 50, 75, 90, 95 and 99. These elasticities are referred to the sensitivity of the probability of choosing each of the alternatives proposed in the model in relation to increases in income.

[Figure 8 about here]

[Figure 9 about here]

[Figure 10 about here]

[Figure 11 about here]

Figure 8 shows the elasticity of the probability of not travelling under increases in income. It shows that for low levels of income, the elasticity of not travelling is low. In absolute value, it starts increasing once the individual has reached a threshold of around 1,500 euros per month. For levels of income above 2,500 euros, tourism demand becomes elastic and such elasticity keeps growing with income. Figure 9 shows the elasticity of the probability of travelling to both sorts of destinations within a year under increases in income. It shows that such relationship is positive and for most of the population the elasticity is above 1. Figures 10 and 11 show the elasticities of the participation decision of travelling only to a domestic destination or abroad respectively. Figure 10 shows that

travelling to domestic destinations only has a positive relationship with income, when income levels are lower than 2,500 euros per month. Above that level of income, the elasticity of travelling domestically only becomes negative and increases in absolute value very much with income. However, in Figure 11 the behaviour of the elasticity of travelling abroad only, shows a positive relationship with income. Comparing Figure 11 with Figure 10, it can be seen that the elasticity is much higher in the case of travelling abroad. Moreover, it shows that the preferences of the population with high income for travelling abroad keeps growing with income, whereas it decreases the interest for travelling domestically only. It underlies the substitution pattern between travelling domestically or abroad.

It should be noted that the precision of the estimation of the elasticities, as shown in the figures with the 95% confidence bands, differ. Figures 9 and 11 show narrow confidence intervals for the elasticities, whereas Figures 8 and 10 have wider bands. Such less precision presented in the estimated elasticities of the decision of not travelling at all or in the decision of travelling domestically only is due to the significance of other variables rather than income. The model has proved that the place of residence matters in the decision and that despite that income is a very important determinant for the decision of travelling, other variables, as shown in the modelling matter. In other words, a wider range of possible elasticity values for travelling domestically only makes sense because the sample considers European countries with different attributes and different willingness to travel at the domestic level. Such wide bands indicates that different countries may have different elasticities for the decision of travelling domestically only. Further analysis should be carried out to prove such

differences. Overall, the analysis of the elasticity values proves the existence of varying and nonlinear income elasticities in all the cases.

VI. Conclusions

Analysis of tourism participation requires information at a more disaggregated level than has tended to occur in the past research. This paper has shown that two main types of determinants are relevant. Socioeconomic characteristics are able to explain how much individuals can travel, whereas the attributes of the place of residence complement this information indicating how much individuals want to travel and where. None of the previous studies of this kind has considered regional attributes of the place of residence of the household as a determinant. This paper proves its relevance. Additionally, including them in the model, reduce the possible bias taken by the socioeconomic characteristics, in particular, the income variable. Moreover, the analysis shows and quantifies the relevance of the key socioeconomic determinants such as income, the size of the family, age, marital status and occupation; and the characteristics of the place of residence such as weather, proximity to the coast, proximity to an international or national airport, extension of natural areas, size of the community or the price of hotels. Their significance varies depending on the kind of tourism destination, at the national or international level. Such knowledge is useful for understanding the origin markets and their potential for keep growing or not. This is key information for tourism destinations for the design of marketing campaigns. Moreover, this model may be used for simulating scenarios for policy making. In particular, it allows the prediction of income changes and may help in determining the reliability and stability of demand from each origin market.

The paper proves that, overall, tourism demand is income elastic. Furthermore, it distinguishes elasticities of not travelling, travelling domestically only, travelling abroad only and travelling domestically and abroad. Their differences show that overall, travelling domestically only has low elasticity, whereas travelling abroad only is much more elastic. From the analysis it is clear that the elasticities vary with income and usually in a non linear way. Indeed, the paper shows the existence of income thresholds. Below or above them, the sensitivity of the demand to each destination varies, and substitution between destinations occur.

Final income results are based on the behaviour of EU-15 countries as a whole. However, results may vary for different countries depending on determinants such as location and weather. Further analysis on this issue may show a more complete picture of the income elasticities and the substitution pattern between travelling domestically and or abroad.

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For Peer Review

Appendix

Defining:

AT_{rm} : Average temperature of region r during month m

TR_{rm} : Total rainfall in region r during month m

DR_{rm} : Days of rainfall in region r during month m

$$\left. \begin{aligned} DT_{rm} &= \begin{cases} 1 & \text{if } 15 \leq AT_{rm} \leq 35 \\ 0 & \text{otherwise} \end{cases} \\ DDR_{rm} &= \begin{cases} 1 & \text{if } DR_{rm} \leq 10 \\ 0 & \text{if } DR_{rm} > 10 \end{cases} \\ DTR_{rm} &= \begin{cases} 1 & \text{if } TR_{rm} \leq 60 \\ 0 & \text{if } TR_{rm} > 60 \end{cases} \end{aligned} \right\} \begin{aligned} W_{rm} &= DT_{rm} \cdot DR_{rm} \\ DR_{rm} &= DDR_{rm} \cdot DTR_{rm} \end{aligned}$$

A set of dummy variables are created such that if they take value 1 they are considered to be within the range popularly known as “good weather”, such that during month m, region r is known to have a good weather if $W_{rm} = 1$. This happens if there is an appropriate combination of temperature (between 15 and 35 degrees Celsius), total rainfall (less than 60 mm.) and number of days with rainfall (less than 10 days) during the month. Data were obtained from the World Meteorological Organization. Yearly measures of weather consist of adding up each monthly dummy variable, such that: $W_r = \sum_{m=1}^{12} W_{rm}$.

Table 1. Bivariate probit estimate of the determinants of the participation decision of travelling domestically and abroad

Variable	Domestic		Abroad	
	Coefficient	(Std. error)	Coefficient	(Std. error)
Socioeconomic characteristics				
Income	0.000194***	(0.000037)	0.000526**	(0.000037)
Income squared	-1.69*e-08***	(5.55*e-08)	-5.14*e-09***	(5.61*e-09)
Gender (male =1)	-0.082***	(0.024)	-0.082***	(0.024)
Age	-0.007	(0.00004)	0.015***	(0.004)
Age squared	0.000	(0.000)	-0.000***	(0.000)
Years of education	0.064***	(0.012)	0.091***	(0.013)
Years of education sq.	-0.001***	(0.000)	-0.002***	(0.000)
Number of children	0.035**	(0.014)	-0.138***	(0.015)
Number of adults	-0.024**	(0.012)	-0.054***	(0.013)
Marital status				
Single	-0.062	(0.062)	0.108*	(0.065)
Married	0.094*	(0.056)	0.001	(0.058)
As married	0.108	(0.071)	-0.071	(0.073)
Divorced	-0.188**	(0.077)	-0.026	(0.078)
Separate	-0.239*	(0.128)	0.052	(0.124)
Occupation				
Working at home	0.016	(0.117)	0.061	(0.120)
Student	0.378***	(0.115)	0.674***	(0.115)
Unemployed	0.111	(0.104)	0.006	(0.106)
Retired	0.353***	(0.081)	0.319***	(0.086)
Fisherman	-0.600	(0.468)	-0.670	(0.457)
Self empl. professional	0.295***	(0.107)	0.640***	(0.111)
Owner of a shop	0.266***	(0.088)	0.390***	(0.094)
Owner of a company	0.406***	(0.101)	0.448***	(0.104)
Employed professional	0.427***	(0.109)	0.463***	(0.111)
General management	0.262**	(0.104)	0.696***	(0.105)
Middle management	0.485***	(0.085)	0.556***	(0.088)
Employed at a desk	0.421***	(0.086)	0.502***	(0.090)
Employed for travelling	0.416***	(0.095)	0.311***	(0.100)
Employed for a service job	0.359***	(0.089)	0.362***	(0.091)
Supervisor	0.389***	(0.110)	0.321***	(0.114)
Skilled manual worker	0.342***	(0.082)	0.196**	(0.086)
Unskilled manual worker	0.262***	(0.094)	0.164*	(0.098)
Attributes of the place of residence				
Weather of the region	0.083***	(0.005)	-0.093***	(0.005)
Region on the coast	0.171***	(0.028)	-0.252***	(0.027)
Size of the community	0.045***	(0.006)	0.017***	(0.006)
Nat. airport within 60 kms.	0.022***	(0.007)	-0.028***	(0.008)
Int. airport within 60 kms.	-0.073***	(0.023)	0.101***	(0.024)
Hotel price of the region	-0.019	(0.012)	0.001***	(0.000)

Area of natural reserves	0.000	(0.000)	-0.000***	(0.000)
Constant	-2.734***	(0.200)	-2.215***	(0.208)
ρ			-0.261***	(0.016)
Log pseudolikelihood	-8,713.6		-8,179.9	
Full model log pseudolikelihood			-16,755.9	
Wald Chi-squared (77)			3,439.66	
Wald test for $\rho=0$			236.77	
Number of observations			16,013	

Note: p-values starred as: * $p<0.10$, ** $p<0.05$, *** $p<0.01$

Figure 1. Participation decision

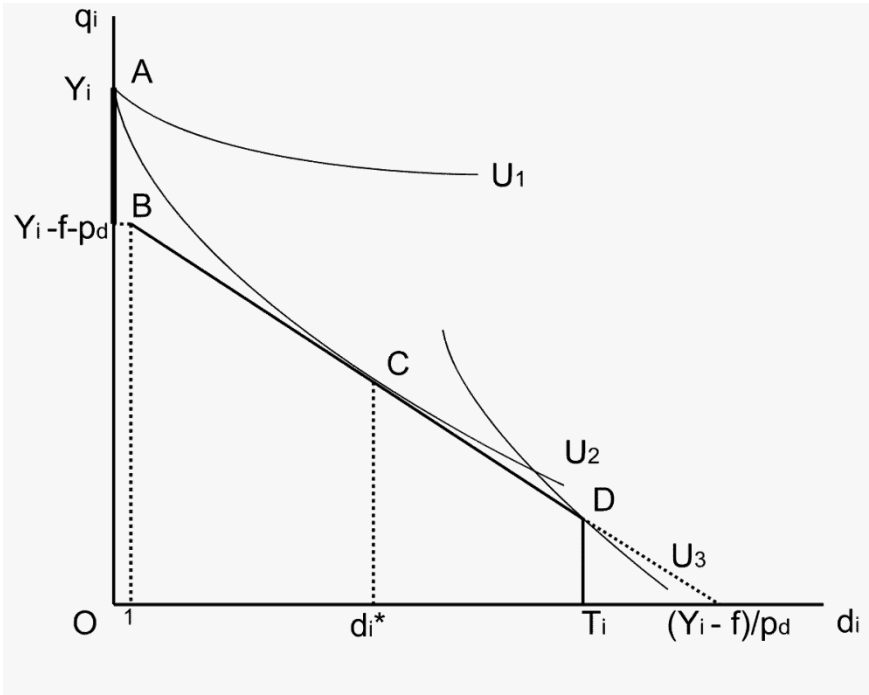


Figure 2. Destination choice: Domestic vs. abroad

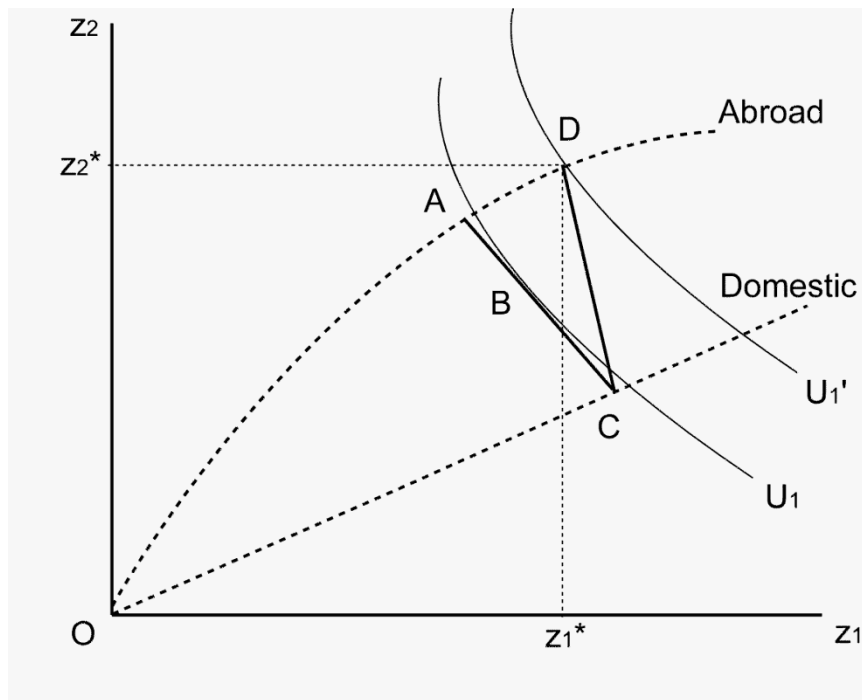


Figure 3. Substitution pattern between travelling domestically and abroad

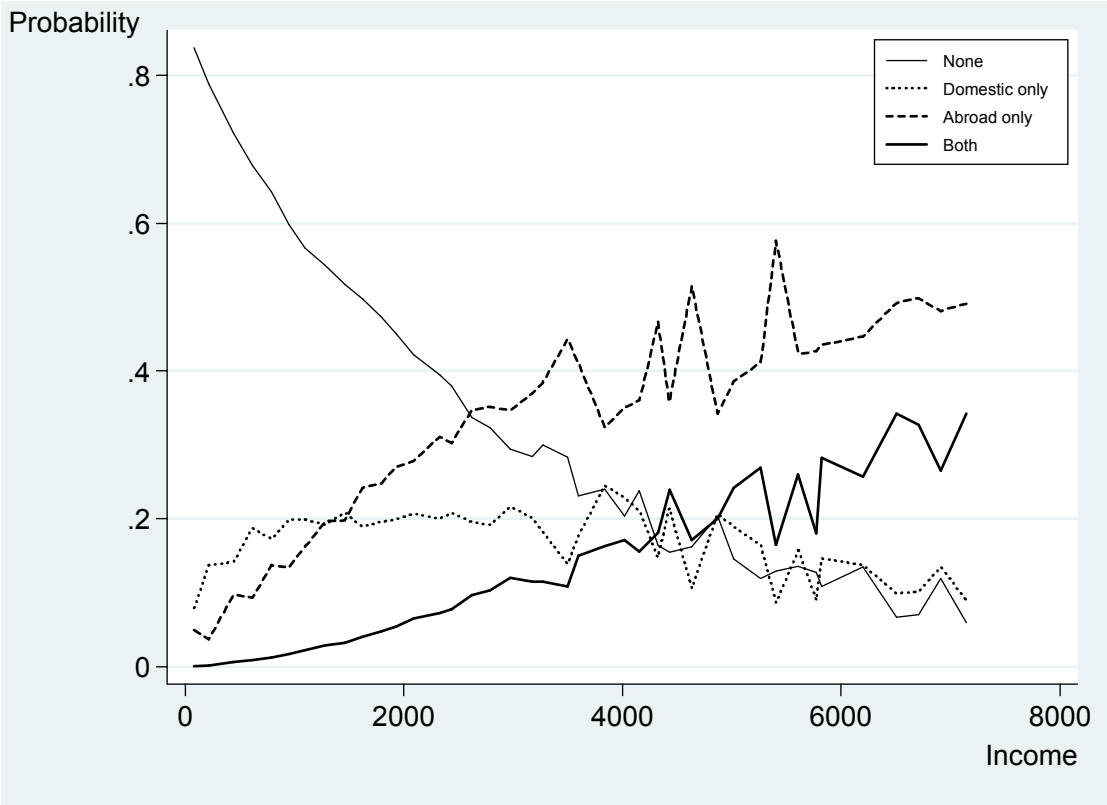


Figure 4. Income and the probability of not travelling

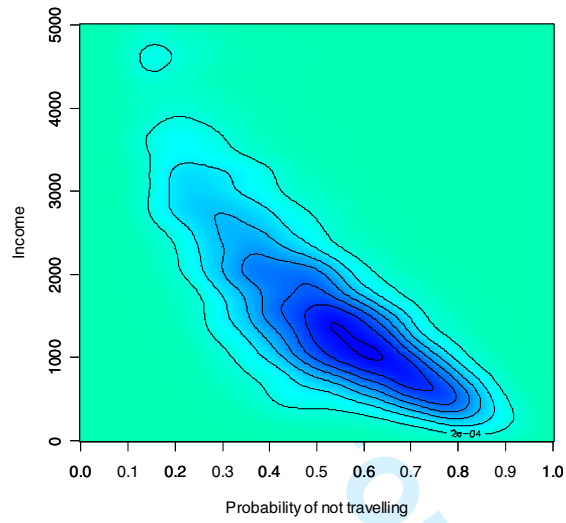


Figure 5. Income and the probability of participating domestically and abroad

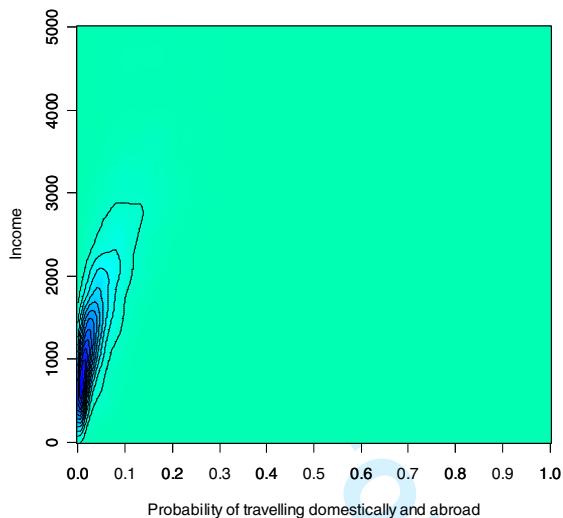


Figure 6. Income and the probability of travelling domestically only

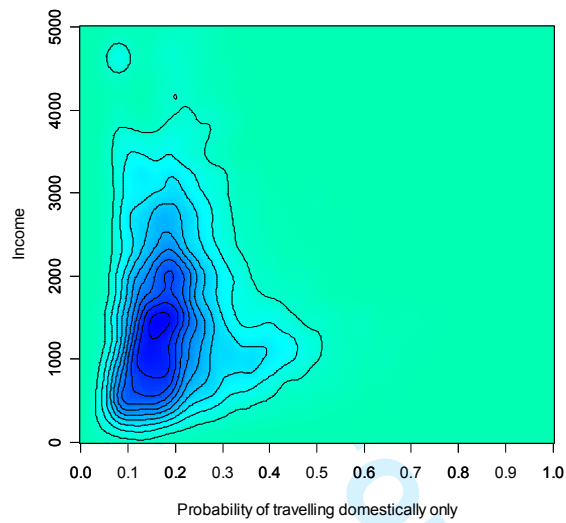


Figure 7. Income and the probability of travelling abroad only

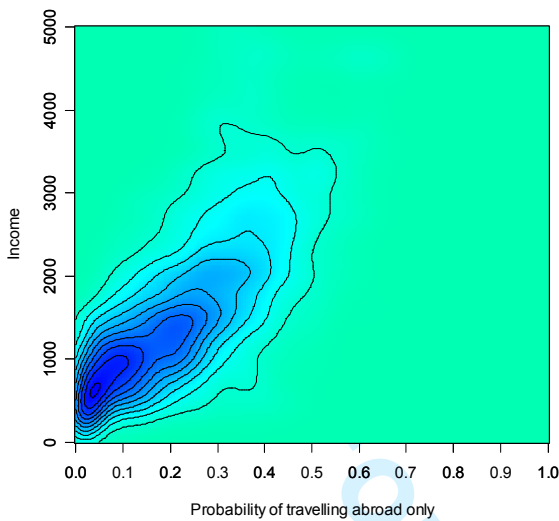


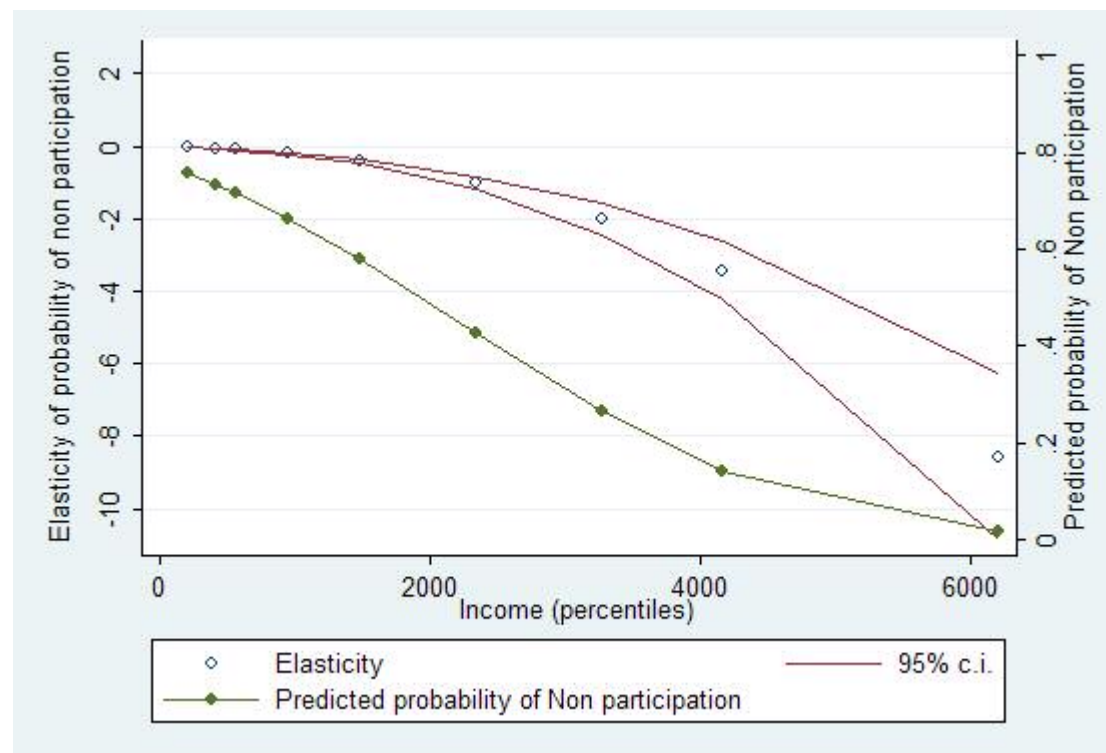
Figure 8. Income elasticity of the probability of non participation within a year

Figure 9. Income elasticity of the probability of travelling home and abroad

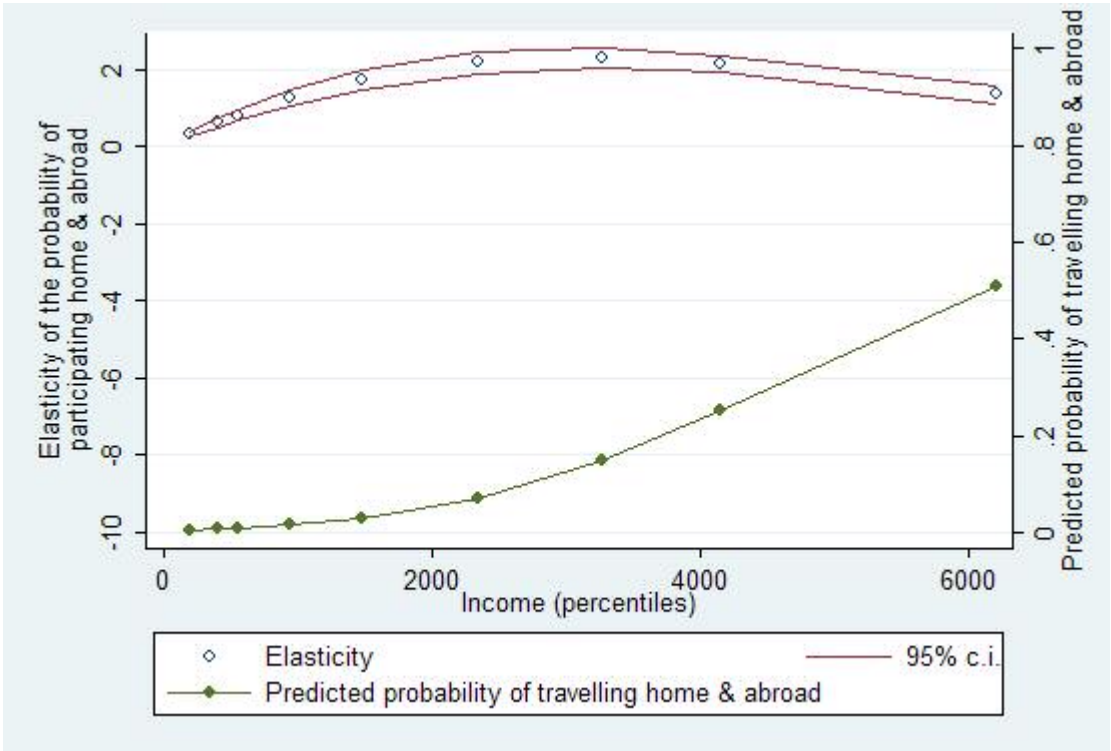


Figure 10. Income elasticity of the probability of travelling domestically only

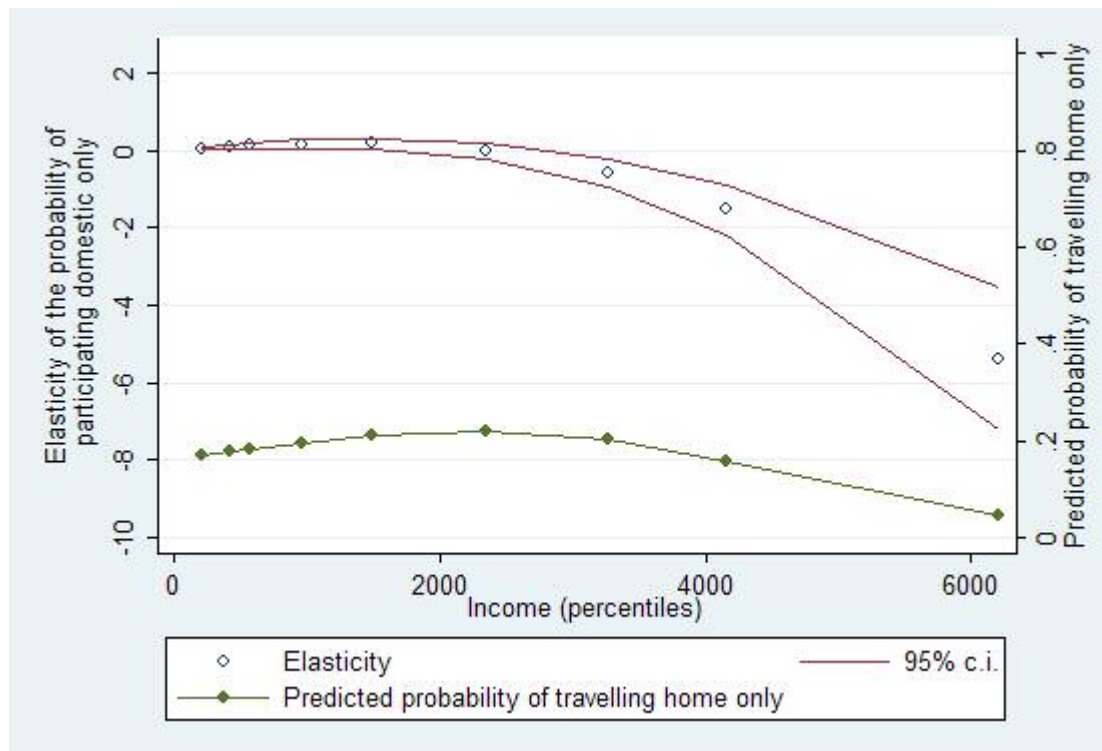


Figure 11. Income elasticity of the probability of travelling abroad only

